Physical Science 2013-14 NAME: _____

8) What scientific equipment do you need in order to calculate potential energy?

BALANCE, METERSTICK, CALCULATOR

9) You are on roller blades on top of a small hill. Your potential energy is equal to 1,000 joules. The last time you checked your mass was 60.0 kilograms.

a. What is your weight in newtons?

$F = MA$ $F = WEIGHT = 60.0\,kg \times 10\frac{m}{s^2} = 600\,N$

b. What is the height of the hill?

$PE = m \cdot g \cdot h$ $1000\,J = 60.0\,kg \times 10\frac{m}{s^2} \times h$ $h = 1.67\,m$

c. If you start skating down this hill, your potential energy will be converted to kinetic energy. At the bottom of the hill, your kinetic energy will be equal to your potential energy at the top. What will be your speed at the bottom of the hill?

$KE = 1000\,J = \frac{1}{2} m v^2$ $1000\,J = \frac{1}{2} 60\,kg \cdot v^2$ $\frac{1000\,J}{30} = \frac{30 \cdot v^2}{30}$ $\sqrt{33.3} = \sqrt{v^2}$ $5.77\frac{m}{s} = v$

10) In a lab investigation, one group of students (group A) measures the speed of a 0.1-kilogram car at 2.5 m/sec at the bottom of a hill. Another group of students (group B) measures the speed of the car at 3 m/sec at the bottom of the hill. The car's starting position at the top of the hill is one-meter high.

a. What is the potential energy of the car at the beginning of the experiment before its speed is measured?

$PE = 0.1\,kg \cdot 10\frac{m}{s^2} \cdot 1\,m = 1\,J$

b. Calculate the kinetic energy of the car for group A using the speed (2.5 m/sec) and mass values above.

$KE = \frac{1}{2}(0.1\,kg)(2.5\frac{m}{s})^2 = 0.31\,J$

c. Calculate the kinetic energy of the car for group B using the speed (3.0 m/sec) and mass values above.

$KE = \frac{1}{2}(0.1\,kg)(3.0\frac{m}{s})^2 = 0.45\,J$

d. At the bottom of a hill, the kinetic energy of the cars should be equal to the potential energy of the car at the top of the hill. Are the kinetic energy values for groups A and B equal to, less than, or greater than the potential energy value?

THEY ARE LESS THAN THE POTENTIAL ENERGY VALUES VALUE AT THE TOP

e. The energy of an object can be converted to heat due to the friction of the car on the hill. The difference between the potential energy of the car and its kinetic energy at the bottom of the hill equals the energy lost due to friction. How much energy is lost due to heat for group A's car? How much for group B's car?

GROUP A $1\,J - 0.31\,J = 0.69\,J$ LOST DUE TO HEAT

GROUP B $1\,J - 0.45\,J = 0.55\,J$ LOST DUE TO HEAT

Wrap-up Questions:

1) The higher an object is off of the ground, the **more**/less potential energy it has.

2) Would a matchbox car have **more**/**less** potential energy on the moon than it does on the earth?
Explain: $PE = m \cdot h \cdot g$ g on earth = $9.8\ m/s^2$ g on the moon = $1.6\ m/s^2$
if g decreases, PE also decreases

3) The faster an object moves, the more KINETIC ENERGY it has.

4) The higher an object is off of the ground, the more POTENTIAL ENERGY it has.

5) Which has a greater effect on the kinetic energy of an object...mass or velocity? EXPLAIN!!!
VELOCITY - INCREASING THE VELOCITY RESULTING IN AN EXPONENTIAL INCREASE IN KINETIC ENERGY

6) Assuming that the ramp in the lab has no friction what could you conclude about the potential energy and kinetic energy. (Hint: Conservation of Energy) THE POTENTIAL + KINETIC ENERGY WOULD BE TRANSFORMED BUT THE TOTAL AMOUNT OF ENERGY WOULD REMAIN THE SAME AND WOULD BE EQUAL TO THE KINETIC PLUS THE POTENTIAL ENERGY

7) A 750-kg compact car moving at 100 km/hr has approximately 3,750,000 Joules of kinetic energy. What is the kinetic energy of the same car if it is moving at 25 km/hr?

$25\ \frac{km}{hr}\left(\frac{1\ hr}{60\ min}\right)\left(\frac{1\ min}{60\ sec}\right)\left(\frac{1000\ m}{1\ km}\right)$

$\frac{3,750,000}{16} = 234375$ UNIT OF ENERGY

Mr. Tima DSHS

6.94 m/s

$KE = \frac{1}{2} \cdot 750\ kg \cdot (6.94^2) = 18084.5\ J$

16

12